The investigation of a fluid-solid interaction mathematical model under combined convective jeffrey flow and radiation effect embedded newtonian heating as the thermal boundary condition over a vertical stretching sheet

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ABSTRACT
The investigation on the interaction between solid and fluid under combined convective flow has been carried out mathematically. The Jeffrey fluid model is taken as the fluid phase and the model is being embedded with the dust particles (solid phase). This two-phase model is constructed by introducing the fluid-particles interaction forces in the momentum equations of the fluid and dust phases, respectively. The natural and forced convections together with the aligned magnetic field are considered on the fluid flow. Also, the Newtonian heating as thermal boundary condition is induced on the vertical stretching sheet. In order to reduce the complexity of the model, the governing equations are transformed from partial differential equation into ordinary differential equation via suitable similarity transformation. The solutions are obtained in terms of velocity and temperature profiles for the fluid and particles phases respectively whereby the Keller-box method is utilized to obtain the desired outcomes. The influences of several significant physical parameters are visualized graphically to clarify the flow and heat transfer characteristic for both phases. The investigation found that the fluid's velocity is affected by the presence of the dust particles which led to decelerate the fluid transference. The present flow model is able to be compared with the single-phase fluid cases if the fluid-particle interaction parameter is ignored.

KEYWORDS
Dusty Jeffrey fluid; Newtonian heating; Thermal radiation; Two-phase flow

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